

METHODS AND APPARATUS FOR DETERMINING CARDIAC OUTPUT

Abstract

[0070] The present invention provides methods and apparatus for determining a 5 dynamical property of the systemic or pulmonary arterial tree using long time scale information, i.e., information obtained from measurements over time scales greater than a single cardiac cycle. In one aspect, the invention provides a method and apparatus for monitoring cardiac output (CO) from a single blood pressure signal measurement obtained at any site in the systemic or pulmonary arterial tree or from any related measurement 10 including, for example, fingertip photoplethysmography.

[0071] According to the method the time constant of the arterial tree, defined to be the product of the total peripheral resistance (TPR) and the nearly constant arterial compliance, is determined by analyzing the long time scale variations (greater than a single cardiac 15 cycle) in any of these blood pressure signals. Then, according to Ohm's law, a value proportional to CO may be determined from the ratio of the blood pressure signal to the estimated time constant. The proportional CO values derived from this method may be calibrated to absolute CO, if desired, with a single, absolute measure of CO (e.g., 20 thermodilution). The present invention may be applied to invasive radial arterial blood pressure or pulmonary arterial blood pressure signals which are routinely measured in intensive care units and surgical suites or to noninvasively measured peripheral arterial blood pressure signals or related noninvasively measured signals in order to facilitate the 25 clinical monitoring of CO as well as TPR.

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